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THE STUDY OF MINUTE INSECTS

BY G. A. FERRIS,

Stanford University, California.

I have often wondered what it is that determines our special interests. Why does one entomologist prefer to work upon dragonflies, another on butterflies and a third on beetles? Why should the discovery of a single species of pseudoscorpion have led one student to begin enthusiastically the collecting and study of these queer little animals? I doubt that there are many entomologists who could give a really lucid answer were they questioned as to the origin of their interest in the special groups upon which they are engaged. To be sure there are some who could, for in some cases their interest might be directly traceable to the influence of a particular teacher, or it may be that the particular institution at which they were students specialized in certain things. Or certain insects may have been especially abundant in their particular locality. Yet doubtless in many cases no such definite starting point can be found.

If we were to study man as we do other animals we would doubtless devise a special terminology to "explain" these things. We would say that so-and-so is positively hemipterotropic or papiliotropic, or whatever else it may be, and let it go at that with a rather comfortable feeling that we have disposed of the matter! We need something of the sort to account for the elderly gentleman who is reputed to climb over the backs of seats in street cars after moths or to pick them from show windows along a world famous thoroughfare in a certain metropolis and to crawl on his hands and knees under the electric lights to the mystification of all the passers-by. To be sure, the passers-by have a word for these actions that satisfies them, but they are not scientific.

As for myself, I am irrestibly drawn toward the smallest and most intrinsically uninteresting of insect forms. I can appreciate the pleasures of the collector who looks with gloating eyes upon his well-filled cabinet of glorious butterflies or gleaming beetles, but I can not expect him in turn to do more than wonder why I also should look with the same feelings upon a well-filled cabinet of little pieces of glass, each one with one or two minute specks in the centre of it. But it is so and my knowledge of ancient languages is not sufficient to enable me to coin a word behind which it is possible to take refuge. I merely know that if an insect is too large to go on a slide I leave it for someone else, and if it is small enough to go on a slide I have an impulse to put it there.

The possession of—or possession by—such impulses, like the "wandering foot," is likely to lead one into strange places. I have noticed that entomologists, just as ordinary mortals, rarely care to do any more work than they are compelled to do. So it follows that those insects which can be taken care of merely by pushing a pin through them are relatively well known, while those minute forms that are useless as cabinet specimens and that require special methods of preparation are usually neglected. Consequently they form the most unexplored fields of entomology.

To one who proposes to enter these fields some spiritual preparation is desirable. There must first of all be the abandonment of interest merely in the things that are beautiful. For there are really few of these minute forms that can in any way be regarded as beautiful, especially after they have gone through the processes that leave them finally mere specters even of their former microscopic selves, encased in balsam beneath a cover glass. One must forget color, for he is passing into a world in monochrome. He must readjust his conceptions of specific characters and be prepared to search for the apparently most trivial and insignificant. He must always and always study structure.

Above all he must be prepared to spend endless hours in the preparation of his specimens. If he be not willing to pay the necessary price in terms of labor, or if he be unwilling or unable to acquire the skill that is essential for the making of good preparations he had best turn his attention to something larger. For the possession of such preparations is the greater part of any work upon such forms. This is a doctrine that is relatively new, if I may judge from the slides from different sources that I have at times examined. I have seen whole boxes of slides—slides, by the way, of which the owners were quite proud—in which almost no significant structures could be seen. Upon such slides the descriptions of new species had been based, yet it was manifestly impossible to give anything even approaching an adequate description from them. I have seen slides bearing the proud label of *"Type"* but containing scarcely enough of the insect to permit the identification even of the genus to which it belonged.

The best of preparations that are attainable are often none too good and no time is wasted that is devoted to obtaining them. If the old saw that "anything that is worth doing at all is worth doing well" be true at all it is doubly so here. A slide once made may last for a hundred years and there is no special reason why it should not last indefinitely if it be made right. Ten minutes spent in the making may save hours of work later. And then a really good slide is something of a work of art. It is something upon which a worker may be proud to write his name.

Such work is not likely to be popular with anyone who must equip his laboratory for himself. The list of necessary things is extensive compared with those that a coleopterist needs. The simple lens, net, cyanide bottle, forceps, pins and pinning boxes, or even the additional pinning boards that the lepidopterist must have, are scarcely comparable with the following series. First and most formidable of all is a binocular microscope. Without this he will be a genius who can get good preparations. Of reagents and mounting media there are caustic potash, 95 per cent. alcohol, carbol-xylene, stain and balsam. Of tools, a pair of dissecting needles, one having the tip bent at a sharp angle; a pair of forceps; a half dozen or more deep hollow slides with ground glass tops; three or four small watch glasses; an alcohol lamp or a small bunsen burner; a small porcelain casserole to boil specimens in, together with a tripod for the support of the casserole; small bottles for the reagents; slides and cover glasses. All of this merely in order to make the preparations. If they are to be studied at all there must be a compound microscope as well.

Now with all of this arranged—as a certain histological text book pedantically advises—"neatly on the table before one"—it is possible to proceed to business. The process has been described many times but I am inclined to think

that it will bear describing again.

The specimens, whether dry or preserved in alcohol, may be placed directly into the caustic potash solution, which should not be more than one of ten per cent., and boiled in the casserole over the lamp. The purpose of the boiling is to disintegrate the body contents and the length of time necessary can only be learned by experience. When these contents have been entirely liquefied the specimen should be removed to clean water in a watch glass and working under the binocular microscope a slit should be made in the body and all the contents carefully pressed out. The specimen should be perfectly clean for even though boiling may have rendered the contents entirely transparent they are still present and if the specimen is stained these contents will take the stain more deeply than anything else.

If the specimen is to be stained it may be transferred directly to the stain which is most conveniently contained in a deep hollow slide. If the hollow be covered with a cover glass and some of the stain allowed to run out under this it will dry and be automatically sealed. Such slides may remain even for days without completely drying up. The necessary data may be written on the ground glass surface of the slide.

The stain that I have always used is magenta, and it is dissolved in ninety-five per cent. alcohol. Consequently when the specimen is probably sufficiently stained—and that may be in a few minutes—it is removed to alcohol of the same grade and the excess stain quickly washed out by pressing the specimen with the curved needle. It should not be allowed to soak, for this reduces the brightness of the stain in the tissues. Then when it is sufficiently washed it should be transferred to carbol-xylene, which will remove the alcohol in a very few moments, and then transferred to balsam on a slide where it is arranged in a suitable manner and covered with a cover glass.

The slides should then be dried, either in the open air or in a very mild oven. To dry them completely might take two weeks but this is hardly necessary. All that is needed is that the outer balsam shall be sufficiently hard to permit the handling of the slides with safety. The slides should then be ringed —and that adds another article, a turn-table, to the list of necessities. The best medium that I am familiar with for this purpose is shellac. The ringing has two objects. One is merely that of neatness, for slides that are thus prepared are undoubtedly neater than those which are not and the other is to prevent, or at least delay, the yellowing that occurs in balsam which has been long exposed to the air.

This, then, is the general procedure, but it admits, in fact, it frequently demands, many modifications. Almost every group of insects will need a slightly different method of treatment. It may be that some are so heavily chitinized that staining is unnecessary. It may be that some combine areas of heavy chitinization which do not need to be stained with other areas that do and consequently both stained and unstained preparations will be required. It may be that certain portions of the body should be dissected off and differently treated. For example, the wings usually suffer badly from the boiling and if it desired to preserve them they should be removed first of all and either mounted separately or with the specimen after it has been treated. It may be that certain portions of the body should not be boiled at all. There is no substitute for a certain amount

of experiment and intelligence. In the case of rather large and fleshy forms which are too much distorted by the weight of the cover-glass it may be necessary to relieve the pressure in some way. This can be done by piling up bits of broken cover-glass but this method has certain deficiencies that will soon become apparent to anyone who tries it. A far better way is to have paper rings that may be piled up to the desired height. They make a far neater appearance and in addition they keep the specimens from floating out from under the coverglass. They also prevent the contraction of the balsam upon drying, which appears in slides prepared by the other method.

One who takes a certain amount of pride in the appearance of his slides will endeavor to place the cover-glass approximately in the center of the slip. Aside from neatness there is the practical reason for this that if the cover-glass be far from the center only one label can be placed on the slide and if at any time it be desirable to add additional data, such as changes of name, there is no place for it. Also it is easier to ring the slides if the cover glass be approximately centered. Perhaps, also, a word about labels will not be out of place. The purpose of a label is to contain data and anything which interferes with this function is out of place. If this opinion be correct there are many types of labels that stand condemned for often at least a tenth of the available surface is taken up with bordering lines of various degrees of thickness that do nothing more than reduce the area which should be available for other purposes. A thin border line which will serve as a guide for trimming the label is all that is necessary.

Now, all of this sounds extremely formidable, and it must be admitted that to obtain a really good preparation does require some experience and some skill. Yet the compensations are so great that after all this is but a small matter. The feeling of relief that one experiences in being really able to see what he wants to see without doubt and without eye straining is in itself compensation. The wealth of previously unknown and unsuspected characters that at times appear is in itself a justification. It is, I am firmly convinced, only by the application of such methods of study that we may be able to escape from that pernicious doctrine which has all too long dominated much of our systematic entomology, the idea of a description as being merely a diagnosis which will—possibly—permit the separation of a species from those already described, which will suffice to "establish the name."

PRODROMUS OF ANDRENA, A GENUS OF BEES

BY HENRY LORENZ VIERECK,
Ottawa, Ont.

(Continued from Page 24.)

Andrena (Andrena) erecta new species

Related to A. (*A.*) *saccata* Vier., in the female presumably related to *A.* (*A.*) *micranthophila* Ckll.

Male. Length 11 mm.; body black, mostly covered with black hair; temples rounded, head covered with black hairs except on vertex where the hairs are ochreous, clypeus slightly convex, more shining and more distinctly punctured than the face, clypearea wanting, sculpture of the clypeus not hidden by the

moustache, labrarea with a broad rounded emargination when viewed from below, polished, joint 3 of antennae : 4 : : 9 : 8, flagel, almost straight in outline, antennae blackish throughout, mandibles atypical, robust, extending a little beyond the outer edge of the labrum and nearly to end of the basal half of their fellow, palpi nearly typical; thorax covered with an abundance of ochreous hairs, hairs of dorsulum seemingly shorter than the brownish and ochreous hairs of the mesopleura, dorsulum dullish, scutel hairy and sculptured like the dorsulum, metanotum hairy like the dorsulum, wing membrane uniformly tinged with brown, legs blackish brown excepting the small joints of the tarsi, which are rather dark brownish, legs covered with blackish and brownish hairs; propodeum with its enclosure poorly defined, with a few irregular rugae at base, finely reticulated, rounded off at apex, rest of upper face with ochreous and brownish hair, propodeal pleura with ochreous and brownish hairs; abdomen with its tergum shining, almost polished, finely reticulated and indistinctly punctured, abdomen with brownish and blackish hairs throughout, anal process narrow, almost parallel sided and right angled emarginate at apex, tergum with erect blackish hairs, hair at apex of abdomen brownish, seventh sternite deeply emarginate; hypopygium of the type present in *A.* (*A.*) *confederata* Vier.

Female. Length 12 mm.; body black, mostly covered with black hairs; head covered throughout with black hairs, fovea filled with dark seal brown hairs, face shiny, reticulate, with distinct punctures that are as many as three or more puncture widths apart, clypeus slightly elevated above the apical margin, convex, sculptured along its margin like the face, its disc polished and with larger and more distinct punctures than on the face, clypearea wanting, clypeus thinly hairy, its sculpture not at all hidden by hairs, looked at from in front the labrarea is subemarginate, but from below distinctly emarginate, labrum with a median longitudinal welt between the labrarea and apical edge of labrum, antennae blackish throughout, mandibles typical, robust, palpi nearly typical; thorax above excepting pronotum including tubercles covered with an abundance of pale ochreous almost white hairs which are shorter on the dorsulum than the black hairs on the mesopleura, scutel hairy and sculptured much like the dorsulum, legs blackish except for the small joints of the tarsi which are more or less dark brown, covered with blackish hairs, scopa typical, its hairs black throughout, tegulae with black hairs, propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with finer black hair than mesopleura, abdomen with its tergum shining, covered almost throughout with erect black hairs, pygidium nearly planate, nearly pointed at apex, fimbria blackish.

Holotype—♂, Victoria, B. C., Apr. 25, 1916 (R. C. Treherne); No. 655 in the Canadian National Collection, Ottawa.

Allotype—♀, Agassiz, B. C., Apr. 27, 1922 (R. Glendenning).

Paratypes—14 ♀ s, Agassiz, B.C., May 11, 1915 (F. W. Sladen) July 7, 1923, (R. Glendenning); Chilcotin, B.C., June 18, 1920 (R. C. Treherne); Lillooet, B.C., 4,000 ft. elevation, June 2, 1917 (A. W. A. Phair), July 16, 1916 (No collector); Saanich Dist., B.C., May 6, 1921 (W. Downes); Golden, B.C., May 17, 1915 (F. W. L. Sladen); Penticton, B.C., May 9, 1919 (E. R. Buckell); Kaslo, B.C., June (Taylor); Royal Oak, B.C., June 20, 1917 (W. Downes), Royal Oak, B.C., June 20, 1917, (W. Downes), Victoria, B.C., June 10, 1923 (K. F. Auden).

The paratypes from Agassiz differ from the type in having some white hairs on the tegulae and one in having some white hairs on the tubercle.

Andrena (Andrena) fulvicrista new species

Has characters in common with *A.* (*Ptilandrena*) *crawfordi* Vier. in the male, the female is related to *A.* (*A.*) *advarians* Vier.

Male. Length 11 mm.; body black, mostly covered with black hair; temples rounded, head covered with black hairs except on the vertex, clypeus convex, polished and more distinctly punctured than the face, clypearea present, sculpture of the clypeus not hidden by the moustache, labrarea nearly transversely oblong, subemarginate, polished, joint 3 of antennae: 4:: 12 : 10, flagel almost straight in outline, antennae mostly blackish, the flagel dark brownish beneath, mandibles atypical, robust, not extending beyond the outer edge of the labrum and falling short of the middle of their fellow, palpi nearly typical; thorax above and tubercles covered with an abundance of dark, dull ochreous hairs, hairs of dorsulum seemingly shorter than hair of mesopleura, dorsulum dullish, mesopleura with blackish hairs throughout, scutel hairy and sculptured like the dorsulum, metanotum hairy like the dorsulum, wing membrane uniformly tinged with brown, legs blackish brown excepting the claws, which are rather dark amber, legs covered with blackish hairs; propodeum with its enclosure poorly defined, with indistinct rugae at base, elsewhere finely reticulated, rounded off at apex, rest of upper face mostly with blackish hair, propodeal pleura with blackish hairs; abdomen with its tergum shining, almost polished, finely reticulated and indistinctly punctured, first tergite with erect blackish and a few pale ochreous hairs, second and following tergites with more or less erect blackish hairs, anal process truncate, almost parallel sided before the expanded apex, seventh sternite deeply emarginate. Hypopygium of the type found in *A.* (*A.*) *lupinorum* Ckll. but with the expanded end of the process recalling what is usually found in species of *Trachandrena*, i. e. with the carina virtually horizontal and the inner edge vertical.

Female. Length 11 mm.; body black, mostly covered with black hairs; head almost entirely covered with black hairs, fovea filled with dark seal brown or blackish hairs, vertex with ochreous hairs, face shiny, indistinctly reticulate, with adjoining or nearly adjoining fine punctures, clypeus at apex not elevated above the apical margin, convex, polished, punctured along its border like the face, clypearea present but poorly defined, the punctures scattered on either side of the clypearea, clypeus thinly hairy, its sculpture not at all hidden by hairs, labrarea subemarginate when looked at from in front, but from below, deeply emarginate, labrum with a median longitudinal welt between the labrarea and apical edge of labrum, antennae blackish, the fourth and following joints of the flagel brownish, mandibles typical, robust, palpi typical; thorax above covered with an abundance of pale ochreous hairs which are as long on the dorsulum as on the mesopleura, tubercles with ochreous hairs, mesopleura with black hairs, scutel hairy and sculptured much like the dorsulum, legs blackish except for the small joints of the tarsi, which are more or less dark brown, covered with brownish or blackish hairs, scopa typical, with black hairs throughout; propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with pale ochreous hair; abdomen with its tergum shining, covered with nearly erect blackish hairs except for some pale hairs on first and

second tergites, apical edge of first, second, third and fourth tergites with a dark brownish translucent border, pygidium nearly pointed at apex, with a triangular embossed area bounded by a channel, fimbria blackish.

Holotype—♂, Chilcotin, B. C., May 19, 1920 (E. R. Buckell); No. 654 in the Canadian National Collection, Ottawa.

Allotype—♀, Penticton, B. C., May 9, 1919 (E. R. Buckell).

Paratypes—2 ♀ s, same data as allotype.

In two paratopotypes with the same data as the allotype the third tergite has a few pale hairs. Three ♀ paratypes with the same data as the allotype have the pale hairs of the abdomen confined to the first tergite. A stylopized paratype from Agassiz, B. C., April 7, 1921 (Sladen) also has the pale hairs of the abdomen confined to the first tergite.

Andrena (Dactylandrena) maura new species

Intermediate between *Andrena* s. s. and *Conandrena*.

Male. Length 9 mm.; body black, mostly covered with blackish hair; temples produced, almost right angular, the angle apparently a little above middle of eye, head covered with blackish hairs except for a few whitish hairs on the vertex, also on face near base of clypeus and a bunch of whitish hairs on the back of the head near the insertion of the mandibles, clypeus convex, polished, sparsely punctured, mostly yellow, the yellow invaded by the black on each side, clypearea wanting, face shining, with adjoining or nearly adjoining punctures, sculpture of the clypeus not hidden by the moustache, labrarea represented by a transverse welt at the base of the labrum, polished, joint 3 of antennae: 4+5:: 12: 10, flagel, almost straight in outline, antennae blackish, flagel beyond joint one dark brownish, mandibles nearly typical, rather slender, mandible extending nearly to the base of its fellow, palpi nearly typical; thorax above and beneath covered with an abundance of whitish hairs, hairs of dorsulum mixed with black hairs and seemingly shorter than the black hair of mesopleura, dorsulum dullish, scutel hairy like the dorsulum but with longer hairs and nearly polished, metanotum hairy like the scutel, legs blackish brown, covered with blackish hairs except on the trochanters which have whitish hairs; propodeum with its enclosure poorly defined, with irregular rugae at base, elsewhere finely reticulated, rounded off at apex, rest of upper face hairy like the mesopleura except for some pale hairs on the edge at the enclosure, propodeal pleura nearly hidden by the uniformly distributed blackish hairs; abdomen with its tergum shining, almost polished, finely reticulated and sparsely indistinctly punctured, first and second tergite and third at base with erect whitish hairs, rest of tergum of abdomen with blackish or brownish nearly erect hairs, anal process narrow, partly almost parallel sided, shallowly emarginate at apex, hair at apex of abdomen dark brown, sixth sternite somewhat reflexed, seventh sternite emarginate, the emargination formed by a prong on each side of the middle of the apical edge; hypopygium of the same type as in *A.* (*Parandrena*) *olivacea* Vier. but with the nearly transverse fold of the process extending upward and inward.

Female. Length 10 mm.; body black, covered throughout with black hairs; fovea nearly extending to antennal line, with its greatest width: ocellocular line :: 8: 14, filled with dark seal brown hairs, vertex dullish sparsely punctured, temples shining, sparsely punctured, face mostly polished, partly indistinctly

reticulate, with distinct punctures that are as many as three puncture widths apart, clypeus distinctly elevated above the apical margin, convex, protuberant, sculptured like the face except that the punctures are larger and sparser, clypearea virtually wanting, clypeus thinly hairy, its sculpture not at all hidden by hairs, labrarea subemarginate, much narrower at apex than wide at base or long down the middle, its apical half mostly parallel sided, a welt between the labrarea and apical edge of labrum, antennae blackish throughout, mandibles nearly typical, robust, palpi nearly typical; dorsulum dullish, finely reticulated, closely punctured, hairs apparently shorter on the dorsulum than on the mesopleura, scutel polished, closely punctured, hairy much like the mesopleura, legs more or less dark brown, covered with blackish hairs, scopa atypical, its hairs loosely arranged, longer than the hind tibiae are wide; propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum shining, sparsely punctured; abdomen with its tergum shining, thinly covered with nearly erect blackish hairs, apical edge of first, second, third and fourth tergites with a brownish border, pygidium nearly planate, swollen down the middle, nearly pointed at apex, fimbria blackish.

Holotype— ♂, Santa Clara Co., Calif. (C. F. Baker, No. 4023), No. 657 in the Canadian National Collection, Ottawa.

Allotype— ♀, Mountains near Claremont, Calif., *Ribes,* (C. F. Baker, No. 4024), in Author's collection.

Andrena (Andrena) banffensis n. sp.

Female. Length 8 mm.; body black, mostly covered with ochreous hairs; head mostly covered with ochreous hairs, fovea filled with dark or blackish hairs, front, temples along the upper edge of the eye and region around the foveae with black hairs, face shining, party indistinctly reticulate, with indistinct punctures that are as many as four puncture widths apart, clypeus slightly elevated above the apical margin, convex, sculptured like the face along the edge, elsewhere nearly polished and more sparsely punctured with the punctures larger, clypearea present, clypeus thinly hairy, its sculpture not at all hidden by hairs, labrarea subemarginate, labrum with a median longitudinal ridge between the labrarea and apical edge of labrum, antennae blackish throughout, mandibles typical, robust, palpi nearly typical; thorax covered with an abundance of ochreous hairs that are shorter on the dorsulum where they are darker than the hairs on the mesopleura, scutel hairy and scultpured much like the dorsulum, legs blackish except for the small joints of the tarsi, which are more or less brownish, covered with brownish golden and ochreous hairs, scopa typical, its hairs of the lower third pale ochreous, almost white, of its upper two-thirds with a dark brownish hue, hairs at base above decidedly darkened; propodeum with its enclosure poorly defined, dullish and finely reticulated, somewhat wrinkled at base, rest of upper face of propodeum covered with finer pale ochreous hair than mesopleura; abdomen with its tergum shining, finely reticulated, first, second, third and fourth tergites with erect ochreous hairs that are longer on the first and second tergites than on the third and fourth, apical edge of first, second, third and fourth tergites with a brownish border, pygidium nearly planate, fimbria dark seal brown.

Holotype— ♀, Banff, Alta., June 5, 1922 (C. B. D. Garrett); No. 665 in the Canadian National Collection, Ottawa.

(To be continued)

A NEW GENUS OF THE FAMILY ACHILIXIIDAE (HOMOPTERA)

BY F. MUIR,
Hawaiian Sugar Planters' Experiment Station, Honolulu, T.H.

Bebaiotes gen. nov.

Type *B. bucayensis* Muir.

Body considerably compressed laterally; tegmina when at rest steeply tectiform with the apical margins closely pressed together. The second claval vein subparallel to the commissure and terminating in the apex of clavus, the hind margins beyond clavus produced but do not overlap when at rest. Sc and R forking about one-third from base, M joining stalk at base, Mf about level with the apex of clavus, M with five apical veins, 1, 2, 2a, 3, 4, M_1 and 2 forking near to Mf, 3 and 4 forking much nearer to apex. The lateral areas of the basal sternites (the third or second and third) produced into a rounded process bearing three hemispherical or cuplike depressions.

The male genitalia are of interest as they bear certain features of the Meenoplini, whereas *Achilixius* does not, but in its chief features it agrees with the family type. The pygofer is small, laterally compressed, margin entire. Anal segment fairly large, apex rounded, dorsal surface concave, anus near base. Genital styles flat, fairly broad, apex truncate, the basal apodeme short, free, the apodeme of the penis being connected to it a little distance from its apex. Aedeagus complex, consisting of dorsal, median and ventral pieces, all more or less acuminate, the base connected to a transverse bar which is fixed to the pygofer.

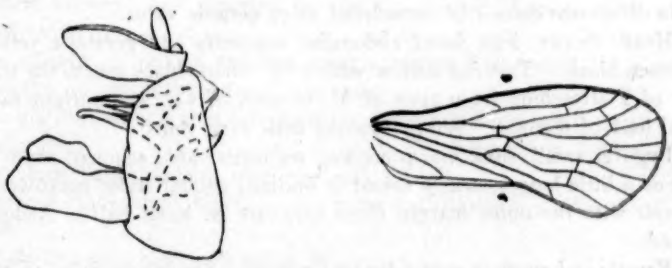

Fig. 1.—*B. bucayensis* Muir. (a) right side view of ♂ genitalia; (b) right tegumen.

Vertex longer than wide; face narrow, long, no median carina; clypeus tricarinate, labrum reaching beyond hind coxae, apical segment long, thin. Antennae terete, first joint a little longer than broad, second joint about twice the length of first. Pronotum tricarinate, hind margin straight; mesonotum tricarinate. Legs fairly thin and long, hind basitarsus about as long as the other two together. Eyes with a deep antennal sinus, lateral ocelli present, median ocellus absent.

The family Achilixiidae was erected for a genus consisting of four species of Malay insects.[1] One of these, *A. tubulifer* (Mel.), was placed by Melichar in the Derbidae but it cannot be retained in that family. For a time I hesitated as to whether it could be placed in the Cixiidae or Achilidae, but a more thorough study of the families of Fulgoroidea demonstrated that the genus must form a distinct family. It is therefore interesting to find two species in Ecuador which

1.—Philippine Journal Science **22** (5) 1923, p. 483.

form a new genus containing characteristics of the family. Further research is likely to increase the family considerably.

Types in the H. S. P. Exp. Stn. collection.

Bebaiotes bucayensis sp. n.

Male. Length 3.8 mm.; tegmen 6 mm. Vertex and frons long and narrow, sides subparallel, lateral carinae not contiguous, no median or transverse carinae on vertex or on frons, base of vertex shallowly emarginate. Pygofer small, sunk into preceding segments, structure as in generic description.

Brown; carinae of thorax and head yellow, the yellow on vertex and frons joining across and forming a series of four brown spots; a series of small yellow spots along the hind margin of prothorax; legs lighter than body. Tegmina light brown or yellowish, veins light, whitish over cross veins and apical cross veins; fuscous between claval veins, around the light cross veins, in subcostal cells and along the sides of the apical veins. Wings fuscous with dark veins.

Female. Similar in color and structure to the male. Ovipositor incomplete, styles small.

Described from four males and one female from Bucay, Ecuador, 1,000 feet elevation (F. X. Williams 10 X 22). Type No. 1097.

Bebaiotes nigrigaster sp. n.

Male. Length 3 mm.; tegmen 5.3 mm. This species differs from *bucayensis* by having the lateral carinae of vertex converge to the apex where they meet and keep in contact to near the apex of frons, making the vertex triangular and the frons linear to near the apex. Experience with other fulgoroids indicates that this difference cannot be considered as of generic value.

Head, thorax, legs, basal abdominal segments and genitalia yellow; rest of abdomen black. Tegmina yellow with a "T"-shape black mark, the transverse portion of T stretching from apex of M_1 to apex of Cu_1, the upright fading out on basal half of tegmen. Wings fuscous with dark veins.

Pygofer small, sunk into preceding segments; anal segment about as wide as long or a little longer, nearly round in outline; genital styles narrower than in *bucayensis* with the outer margin more excavate on basal half. Aedeagus not examined.

Female. Length 3 mm.; tegmen 5 mm. Similar in color to the male. Ovipositor incomplete, styles small.

Described from one male and one female from Bucay, Ecuador, 1,000 feet elevation (F. X. Williams 7, X, 22). Type No. 1098.

SYNOPSIS OF THE GENUS CHRYSOTOXUM WITH NOTES AND DESCRIPTIONS OF NEW SPECIES (SYRPHIDAE, DIPTERA)*

BY C. HOWARD CURRAN,
Ottawa, Ont.

For several years specimens of the genus *Chrysotoxum* have been accumulating in my collection and many specimens received for determination are on hand. Other work has prevented a study of the specimens until just recently. The results are quite interesting and a table of species and notes are appended. The fact that I have specimens determined by a number of specialists in Diptera,

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

in some cases the determinations resulting in a single species being placed as three distinct species, in others, three species being placed as one, all by the same individual, furnishes sufficient evidence of the difficulty of determining specimens of this genus. It is extremely difficult to draw correct conclusions from descriptions when only a few specimens are on hand, but a good series enables one to work with moderate accuracy and the variations are covered. It is significant that *C. pubescens* and *C. ventricosum* have been interchanged, although I am not at all certain that the latter species is actually represented.

The genus may be distinguished from all others of the Syrphidae by its wasp-like appearance, margined and usually "beaded" abdomen. The yellow fasciae are quite distinctive of the group. All are moderately alike; the females all have a large yellow pollinose spot on either side of the front. The antennae are long and porrect. The greatest variation within a species is found in the color of the legs and the margin of the abdomen. The latter may be all yellow beyond the second segment or may be largely black, and both may occur in every species found in North America, but possilby two or three species may not have this variation.

TABLE OF SPECIES.

1. A yellow spot above the front coxae ..... *luteopilosum* n. sp.
   No yellow spot above the front coxae 2
2. Third abdominal band not interrupted, the second usually sub-interrupted ..3
   Second and third abdominal fasciae interrupted, at least both narrowly so ..6
3. Side margins of the third and fourth abdominal segments without minute black bristles; side margins beyond the second segment usually wholly yellowish ..... *laterale* Loew.
   Side margins of second and following segments with minute or short black bristles on apical three-fourths or more 4
4. Side margins wholly yellow beyond the second abdominal segment, or practically so ..... *integre* var. *willistoni* n. var.
   The black bands extend over the side margins 5
5. Middle femora partly black pilose or the scutellar pile all short and yellowish 7
   Middle femora wholly pale pilose 6
6. Second ventral segment with an entire to moderately interrupted posterior yellow band ..... *integre* Williston
   Second segment not with an apical yellow band, or with the apical segments nearly all pale yellow ..... *coloradensis* Greene.
7. Second ventral segment without apical fascia or spots, the base sometimes yellow 8
   Second ventral segment either with an apical fascia or apical spots 9
8. Thorax wholly yellow pilose or with only a few black hairs posteriorly and laterally; abdomen wholly yellow pilose; second antennal joint three-fifths as long as third; ♀ scutellum yellow pilose ..... *pubescens* Lw.
   Thorax in part black pilose; ♀ scutellum almost all black pilose 12
9. Side margins of second abdominal segment wholly yellow 10
   Side margins of second segment not wholly yellow 11
10. First abdominal segment black pilose; thorax in part black pilose; anterior four femora largely black pilose, their bases black; anterior coxae with

black hairs apically ..... *occidentale* n. sp.
Base of abdomen and the mesonotum wholly pilose, at most a few black hairs; anterior coxae wholly yellow haired ..... *ypsilon* Will.

11. Front of ♂ yellow and wholly yellow pilose; thorax in both sexes yellow pilose; V on fifth segment broad ..... *villosulum* Bigot
Front of male chiefly black pilose; thorax of ♂ ♀ largely black pilose; if wholly yellow pilose the pile often short and the V on the fifth segment always narrow, about as wide as that in common use 12

12. The V narrow, the distance between its arms at apex less than the length of one arm; thorax of ♀ often chiefly or all yellow pilose 14
The V broad, the distance between its arms much greater than length of one arm; thorax of both sexes largely black pilose 13

13. Side margins of third abdominal segment with a fringe of small, black, bristly hairs ..... *derivatum* Walker
Side margins with only a few black bristles apically .. *fasciolatum* De Geer

14. Second antennal joint decidedly longer than the first; second abdominal fascia often uninterrupted ..... *pubescens* Loew
Second joint not longer than first, sometimes sub-equal; second abdominal fascia sometimes uninterrupted 15

15. Second antennal segment but little shorter than the first; generally smaller, 10-12 mm.; the V slender ..... *ventricosum* Loew
Second antennal segment decidedly shorter than the first; larger (12.5—14.5 mm.), the V thick ..... *laterale* Loew

= pubescens

Chrysotoxum luteopilosum new species

Readily distinguished from all species known to me by the posterior yellow margin of the second abdominal segment, interrupted abdominal bands, chiefly black lateral margin and very elongate second antennal joint.

Length, 12 to 14.5 mm. *Female.* Face creamy yellow, cheeks reddish yellow; a little retreating, gently concave, the tubercle long and not prominent, except on its lower margin; pile fine, sparse, yellow, moderately long; the yellow does not usually extend as high as the upper base of the antennae. Front shining black, with sparse black moderately short pile; lateral third of the sides on lower half yellow pollinose, but appearing brownish opposite the antennae in most lights. Occiput greyish white, with silvery white pile, yellow pile on upper fourth. Antennae black; arista reddish, the apical third black; second joint distinctly longer than the first, and almost as long as the third, its upper inner end broadly prolonged; hairs black.

Thorax shining black, often a little bronzed laterally; side margins moderately broad, narrowly or broadly interrupted; mesopleura, a spot below, epipleura and *a spot above the front coxae* yellow; humeri wholly or chiefly yellow, (no distinct brown spot). Median lines cinereous or slightly yellowish, complete in fresh specimens, but broadened and almost fused before the scutellum. Pile wholly yellow. Scutellum yellow, with a large transverse blackish discal spot, the pile sometimes all yellow, or it may be almost all black, but usually the base and sides largely yellow haired.

Legs yellow, tibiae paler; anterior four femora usually brownish yellow basally, yellow pilose, including the front four coxae. Anterior coxae brownish or ferruginous.

Wings hyaline; costal, sub-costal and first marginal cell yellowish to just beyond the end of the first vein. "Foot" normal in shape.

Abdomen shining black; yellow as follows: Broad sides of the first segment; an arched, moderately interrupted fascia on the second segment before the middle, its outer ends joining the posterior, narrow fascia, which is a little wider towards the middle but slightly constricted on the middle line. Third segment similar but the yellow fascia nearer the front margin. Fourth segment similar to third but posterior band very broad in the middle, so that it occupies half the segment at this point, the median black fascia narrow. Fifth segment with the narrow base and sides and a moderately broad V, its stalk half as long as one arm, its base a little rounded, its arms diverging just at apex, black. The width of the V at the apex is about equal to the length of the arm. Second and following ventral segments with the apex yellow on the sides, the spots elongate triangular, the third and following segments each with an elongate oval yellow spot. Pile on the dorsum yellow, moderately long, shorter on the disc; on the second and following segments on the black bands and behind them with shorter, sub-appressed black pile, but the yellow pile extends quite over the black bands on the middle of the fourth and fifth segments. There are no black spinules on the sides of the second segment except just the tip and only a few on the third; the fourth and fifth bear them on the apical three-fourths. The ♂ shows only sexual differences.

Holotype— ♀, Winnipeg, Man., July 30, 1918, (J. B. Wallis); No. 575, in the Canadian National Collection, Ottawa.

Allotype— ♂, Lincoln, Neb., June.

Paratypes— ♀, North Saugus, Mass., August 13, 1911, (J. D. Tothill); ♀, Butternut Creek, Ithaca, New York, July 25, 1920, (Cornell Collection); ♀, Ithaca, N.Y., Aug. 25, 1919, (E. G. Anderson); ♀, Milburn, N.J.; ♀, West Englewood, N.J., on *Polygonum virginianum*; ♀, White House, N.J., July 9, 1918 (A. Nicolay); ♀, Inwood, N. Y., Aug. 26, 1917, (F. M. Schott); ♀, Stockholm, N.J., July 10; ♂, Newark, N.J., June 27, 1894, (C. W. Johnston); ♂, Gloucester, Mass., July 8, (C. W. Johnson); ♀, Boston, Mass.; ♀, Auburndale, Mass., Aug. 28; ♀, Auburnvale, Mass., Sept. 20, all C. W. Johnson; ♀, Framingham, Mass., Aug. 11, 1916, (C. A. Frost).

Distinguished from all described North American species by the yellow spot above the anterior coxae. There are, however, two other species with this character in manuscript.

Chrysotoxum occidentale new species

Abdomen elongate; side margins wholly yellow beyond the second segment; base of abdomen largely black pilose; base of anterior four femora broadly brown, black pilose. Allied to *ypsilon* Williston.

Length 17 mm. *Female.* Face and cheeks yellow; very slightly concave as the tubercle is long and not conspicuous; pile moderately long, fine, yellow. The yellow does not extend above the upper base of the antennae, or only slightly so. Front deep black, a little shining; across the middle with a broad, moderately interrupted yellow band; wholly black pilose or with some yellow hairs on the pollinose spots laterally. Occiput whitish grey pollinose, with yellow pile; that on the lower third silvery white; all the hairs on the upper fourth or

less black. Antennae black; arista dull yellow, its apical fourth black; second joint a little longer than the first, its inner apex a little longer above, obtusely rounded, leaving a moderately broad strip of the third joint exposed below; third joint longer than the basal two combined; hairs all black.

Thorax blue black; side margins broad; broadly interrupted at the suture. Mesopleura, a small spot below, more or less distinct, and the epipleura, yellow; humeri brownish except the hind margin. Median greyish stripes obsolete beyond the apical third, but the whole disc has a greyish sheen when viewed from in front. Pile moderately long black, on the front half and behind the wings on the sides intermixed with yellow; on the pleura, except below the base of the wings mostly yellow. Scutellum transluscent brown with a transverse, yellow sub-basal fascia and the broad apical margin, yellow; pile long, black.

Legs reddish yellow; tibiae whitish; basal fourth, extending to half behind, of the femora, brownish; pile yellow, short; on the posterior side of the front four and anterior side of the hind femora, long, black. Hair on front and middle coxae and trochanters yellow, but the apical hairs on the former, long, black; hind coxae and trochanters black haired.

Wings hyaline, anterior margin brownish yellow, darker beyond the stigma. The foot formed by the first posterior cell is of moderate size, not clumsy, with a distinct heel, and narrowed above the ankle.

Abdomen shining deep black; sides of first narrowly and the side margins beyond the basal half of the second segment reddish yellow. Band on the second segment moderately broad, broadly interrupted medianly, reaching the side margins in its full width, the inner half narrower than the outer, front margin not strongly convex; hind margin concave on lateral half of each spot; the spots join the yellow spot on the posterior angles which extend inward to about the lateral sixth. Fasciae on the following segments very similar in shape, but of nearly equal width, not so widely interrupted and sub-truncate medianly, the hind margins of the segments, successively more so, broadly, yellow, that of the third segment evenly so, the others more broadly yellow medianly. The broad V on the fifth segment has a long basal stalk; its width at the apex is one and a half or more greater than the length of one arm and three times greater than the stalk. In the type the V is thick, in the paratype, interrupted on either side of the base but still rather thick, although its arms are not joined to the anterior black band as in the type.

Holotype—♀, British Columbia, (Taylor), No. 586, in the Canadian National Collection, Ottawa.

Paratype—♀, Mountains, Moscow, Idaho, July 10, 1920, (R. C. Shannon), in Mr. Shannon's collection.

Allied to *ypsilon* in structure, size, etc., but readily distinguished by the black bases of the femora, much more black haired thorax and base of abdomen; broader apical segmental fasciae and blacker lower half of front. In *ypsilon* the apex of the third abdominal segment is more broadly yellow in the middle and the yellow fasciae are more narrowly interrupted, the first one more pointed medianly; the second ventral segment has a complete apical yellow fascia; in *occidentale* the fascia is broadly interrupted or just the very apex on the middle half reddish.

Chrysotoxum ypsilon Williston

Described from New Mexico. Easily recognized by its large size and broad bright yellow bands. Length 15 to 20 mm.

Ten specimens from Arizona and New Mexico.

Chrysotoxum laterale Loew

Described from New York. Only the female is known and it is characterized in typical specimens by the yellow lateral margin of the abdomen beyond the second segment, entire abdominal fasciae and complete yellow apical fascia on the second ventral segment. In some specimens the lateral abdominal margin is not yellow except where the bands reach it, the black ground extending to the margin.

Seven specimens: 2 ♀, Lake George, N.Y., Sept. 4, 1920, (M. D. Leonard); ♀, Maine; ♀, McLean Bogs, Tompkins Co., N.Y.; Aug. 29, 1921, (R. C. Shannon); ♀, Orillia, Ont., Aug. 10, 1919, and Sept. 12, 1920, (C. H. Curran).

Chrysotoxum integre Williston

Described from Arizona. In typical specimens the sides of the abdomen are black except where the yellow fasciae go over them; the second and third bands are entire or practically so but there may be a very fine line interrupting them medianly, but this line is reddish and not black. The sides of the segments bear small spinules; the apical fascia on second abdominal segment entire; hind margin of second segment usually very narrowly yellow.

Four ♂, New Mexico; ♂, Arizona; ♀, Ft. Collins, Colo. This latter appears quite typical.

Chrysotoxum integre var. **willistoni** n. var.

A female from Jemez Springs, New Mexico, has the side margins of the abdomen orange colored beyond the second segment. This variety may be known as *integre* var. *willistoni*.

Chrysotoxum pubescens Loew

Originally described from Illinois. Recorded by Williston from New York. This species goes under the name *ventricosum* in most collections but is readily distinguished by the length of the second antennal joint, which is decidedly longer than the first. The base of the anterior four femora is blackish; the V is narrow, but slightly wider than in *ventricosum*. There can be no doubt about the identity of the species. Williston's identification seems doubtful. The size averages larger than *ventricosum*—12.5 to 14.5 mm.

Specimens examined: Nebraska, 4 ♂, 2 ♀, June 18 to Sept 9; Manitoba, 4 ♂, 3♀, June 13 to Aug. 23; 2 ♀, no data.

Chrysotoxum ventricosum Loew

Originally described from D. C.; since variously recorded but identification largely doubtful. In most collections this species is under the name *pubescens*. There has been great confusion between these two species, and the type of *ventricosum* is lost. Possibly Loew decided that his species was the same as *derivatum* Walker, as the two descriptions read much alike. However, the narrow V in what I consider *ventricosum* at once distinguishes it from the majority

of species and it is readily separated from *pubescens* by the sub-equal first two antennal joints. The size is generally smaller; 10 to 12 mm., the majority not over 11 mm., which agrees with the size given by Loew.

Specimens examined: ♂, Happy Hollow, Larimer Co., Colo., Aug. 13; ♀, labelled "Spruce Grove, July 21, 1904"; ♂, ♀, Husavick, Man., July 5, 7; ♀, Port Sydney, Ont., July 9; ♀, Plummer's Island, Maryland, May 7, 1916.

Chrysotoxum villosulum Bigot

Originally described from Washington State, but placed as a synonym of *derivatum* by Williston. It is quite distinct from that species and readily recognized by the yellow front in the male, yellow pilose thorax and broad V. 14—16 mm.

Specimens examined: Oregon: ♀, Mt. Hood, July 30, 1921; Idaho: 3 ♀, Mts., Moscow, July 25; Washington: 2 ♂, 2 ♀, Bird Creek, July 24.

Chrysotoxum derivatum Walker

Described from Hudson's Bay Territory, probably from what is now Northern Ontario. It is northern and western in distribution. The only question of identity arises because of the occurrence of *C. fasciolatum* in the region of Lake Nipigon. If Walker's types were from further west, which is quite possible, there can be no question of synonymy. The second antennal joint is longer than the first. Length 13.5—15 mm.

Specimens examined: Alberta: 8 specimens, Banff, June and July; British Columbia: 4 specimens, June, July; Oregon: 2 specimens, July; Washington: 6 specimens, June to August; Colorado: ♀, Aug. 24.

Chrysotoxum fasciolatum Degeer

Originally described from Europe. Larger and a little more slender than *derivatum*, with longer antennae; but not always separable by shape. Most readily distinguished from the preceding species by the presence of only a few black bristles on the lateral margin of the third abdominal segment apically while *derivatum* has many. Length, 14—17.5 mm.

Fifty specimens from New Brunswick, New Hampshire, Quebec, Northern Ontario and one specimen from Idaho.

In Dr. C. W. Johnson's collection are some European specimens which agree perfectly with my examples. One specimen from Europe has numerous bristles on the sides of the segments, but I am not certain that it is conspecific.

ON THE SYSTEMATIC POSITION OF THE CARABID, *STEREOCERUS HAEMATOPUS* DEJ. (*SIMILIS* KBY.) [COLEOPTERA]

BY L. L. BUCHANAN,

United States Biological Survey, Washington, D.C.

Among a small collection of Coleoptera brought back from northern Alberta and Saskatchewan by Francis Harper in 1920, were found three specimens of *Stereocerus haematopus*. By standard synopses this species runs to the Pterostichini, characterized by the bisetose penultimate joint of the labial palpus, as opposed to the Amarini, where the corresponding member carries several bristles. The species under consideration has an unmistakable Pterostichus-type of palpus —bisetose—though in our catalogs it is assigned a place with the pleurisetose Amarini. A rather detailed study of the anatomy of *Stereocerus* reveals some

additional evidence indicating that the beetle is a misfit in its present surroundings, and might more properly be placed with the Pterostichid genera.

Most important of its peculiarities is the bisetose palp, a fundamental character in this section of Carabidae, *Evarthrus* and one or two allied genera or subgenera being the only exceptions, so far as known, among the numerous North American species. The mandibles are not short and chunky, like the jaws of those genera with which it is now associated, but are moderately long and give to the head a more elongate appearance, resembling rather closely the form seen in some Pterostichini, as *Bothriopterus*. The extension of the frontal groove across the suture on to the epistoma is also significant; this feature is more or less developed in a number of the Pterostichini, but is totally lacking in any Amarid examined. The faintly impressed lines paralleling the thoracic side margins, but at some distance from them, is a character apparently not found in any Amarid genus, but a strikingly similar condition exists in *Bothriopterus*; and, pointing towards this genus also, may be mentioned the occasional continuity of the row of ocellate punctures along the elytral margin, these being always broadly interrupted medially in *Curtonotus*, *Bradytus*, etc. Hayward describes these punctures as interrupted in *Stereocerus*, and such is the case in the majority of specimens, but in seven or eight of the two dozen or more individuals at hand, the punctures, though more widely spaced medially, are continuous. This is an unusually high degree of variability for such a character, though, like many other northern Carabids, the present genus exhibits a lack of constancy in several ordinarily stable structures. (In this connection see Professor Wickham's comments on Pribilof Islands Coleoptera, N. A. Fauna, No. 46, p. 150).

The lack of strong punctures along sides of metasternum and first ventral segment, the metallic coloration, and the very stout antennae also favor a removal from the Amarini. The mentum is of the usual *Pterostichus* type, with a broad median tooth which is emarginate at apex.

The comparative lengths of the palpal segments in *Stereocerus* agree with the key definitions of the Amarini,—i.e., penultimate longer than the last—and possibly this factor is responsible for its inclusion in the *Amara* series. However, the relative lengths of the palpal segments in some Pterostichini are not greatly different, and in *Pterostichus* (*Poecilus*) *lucublandus* the penultimate joint is at least as long, relatively, as in *Stereocerus*. The feebly bisinuate mid-tibia of ♂ may be, as thought by Hayward, an indication of relationship to *Amara* (*Curtonotus*) where the mid-tibia of ♂ is dentate internally; this, together with the comparative lengths of the palpal joints, apparently constitute the only grounds for retaining it in its present position near *Curtonotus*, but seem of much less value than the reason given above for its transfer.

Just what position *Stereocerus* would occupy in the Pterostichini is not clear; but for its lack of dorsal punctures it might be placed near to *Bothriopterus*, to which in several special characters and in habitus it is somewhat allied. One of Harper's specimens, in fact, does have a large dorsal puncture on the third stria of each elytron, but closer to the base than the first puncture in *Bothriopterus*. The dorsal punctures are, however, a variable feature (as in *Cryobius* where the range is from 2 to 5 or 6), and lacking a more suitable place, *Stereocerus* might follow *Bothriopterus*, and be separated from it and from all other Pterostichini having elongate met-episterna, by the lack of dorsal punctures, the very stout

antennae, and the feebly bisinuate middle tibiae of ♂.

The following localities are represented in the material examined: Ungava Bay, Hudson Bay; White Mts. and Mt. Washington, N.H.; Lake Athabasca, Saskatchewan.

Papers of Horn, Wickham, Hayward, and Casey were consulted in drawing up this note.

SOME NEW CANADIAN ARGYNNID RACES (LEPID.)*

BY J. MCDUNNOUGH,

Ottawa, Ont.

Argynnis nevadensis Edw.

Typical *nevadensis* as figured by Edwards (Butt. N. Am. I, Pl. 33; III, Pl. 5, Arg.) is a rather pale small species with a well-defined submarginal yellow band on underside of secondaries. It occurs in Nevada on the eastern slopes of the Sierras.

The race *meadi* Edw. from Colorado is well figured by Edwards (Butt. N. Am. II, Pl. 2, Arg.) it is much darker on the upper side and the green of the underside of secondaries is deeper in color and spread out over practically the entire surface; the size is also larger. In the foothills of southern Alberta we meet with another form of the species, a fact which has already been commented on by Wolley-Dod (Can. Ent. 1901, p. 159; l. c. 1908, p. 152) who found it common in the Calgary region. I also took it sparingly at Waterton Lakes and the National Collection contains specimens from Saskatchewan and Aweme, Man. In size this race equals the largest specimens of *meadi* but the brown of the upper side is paler and the black markings generally less heavy (more as in *nevadensis*); the green of the underside of secondaries is of a much paler tint and not so evenly spread, the discal and submarginal areas showing numerous yellow patches. The size alone distinguishes it from *nevadensis;* the yellow subterminal band of the under side of secondaries is also not so well defined. For this race, which in Canada at least is constant, I propose the name **calgariana.**

Holotype—♂, Calgary, Alta., June 23, 1900, (F. H. Wolley-Dod), No. 632 in the Canadian National Collection.

Allotype—♀, Calgary, Alta., July 12, 1900, (F. H. Wolley-Dod), in the Canadian National Collection.

Paratypes—4 ♂, 12 ♀, Calgary, Alta., various dates; 1 ♀, Lethbridge, Alta., Aug. 7, (T. N. Willing); 2 ♂, 5 ♀, Waterton Lakes, Alta., (J. McDunnough), various dates in July.

From the Cariboo district of British Columbia we have received specimens which resemble *meadi* on the upper side but have the green areas of the under side of secondaries partially clouded with brownish, especially in the female. A very similar form occurs in the Osoyoos region and there is also a pair of specimens in the National Collection taken by Wolley-Dod at Brisco in the Upper Columbia Valley. This race is possibly general over southern British Columbia and I propose for it the name **semivirida.**

Holotype—♂, Aspen Grove, B. C., July 14, 1922, (P. N. Vroom); No. 633 in the Canadian National Collection.

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*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

Allotype—♀, same data, in the Canadian National Collection.

Paratypes—1 ♂, 2 ♀, same data; 1 ♂, June 28, in the Canadian National Collection.

Argynnis halcyone Edw.

Typical *halcyone* from Colorado is well figured by Edwards (Butt. N. Am. I, Pl. 9, Arg.; l. c. III, Pl. 5, Arg.). We have received a series of specimens from the Cariboo district of British Columbia which seems to represent a smaller race of this species. The black markings of the upper side are heavier, the basal section of the wings being more black-shaded. On the under side the red-brown of secondaries is brighter and generally heavier and the silver spots frequently smaller. For this race I propose the name **picta.**

Holotype—♂, Aspen Grove, B. C., July 14, (P. N. Vroom); No. 634 in the Canadian National Collection.

Allotype—♀, same data.

Paratypes—5 ♂'s, same locality, June 28, July 14.

NEW SPECIES OF NORTH AMERICAN CAPNIIDAE (PLECOPTERA)

BY P. W. CLAASSEN,
Cornell University, Ithaca, N.Y.

The stoneflies of the family Capniidae which have heretofore been described from North America have been placed under the following genera: *Capnia* Pict., *Arsapnia* Banks, and *Capnura* Banks.

A careful study of Pictet's description and figures of *Capnia* (Type, *C. nigra* Pict.) shows *Arsapnia* Banks to be synonymous with *Capnia* Pict.

Capnura Bks. is very closely related to *Capnia* Pict. and should probably be regarded as a subgenus of *Capnia* Pict.

Capnia pygmaea Burm., as commonly identified, and other eastern species, however, can not be put under either of the above genera and are here placed under a new genus, *Capnella* gen. nov., of which *Capnella granulata* sp. nov. is the type.

Capnella gen. nov.

Small blackish species, mostly under 10 mm. in length; usually winged, the males often short winged and in at least one species the males are wingless.

Head blackish, wider than prothorax; ocelli three, the hind ocelli closer to the eyes than to each other. Antennae blackish, long.

Prothorax usually a little wider than long; angles rounded; surface slightly to moderately rugose. Legs nearly uniformly brown or blackish; middle tarsal segment very short; first and third tarsal segments subequal. Wings subhyaline, with heavy irregular venation, the veins often ending blindly; subcosta short, usually not reaching farther than to a point half way between the origin of Rs and the cord; no crossvein beyond the end of Sc, or if present it is very near the tip of R_1; anal field of hind wings large and nearly as long as the rest of the wing.

Abdomen blackish; cerci or tails long, composed of many (fifteen or more) segments.

Genitalia. Male. Supraanal process recurved upon the dorsum of the abdomen and divided longitudinally into two parts, an upper chitinized process which serves as a probe and a lower excavated sheath in which the upper probe rests; eighth abdominal tergite usually bears a single or double knob, under or

against which the supraanal process fits; ninth and tenth abdominal tergites with a median longitudinal groove in which the supraanal process normally lies (this results in the bifid appearance of these two tergites); subanal lobes small, somewhat triangular; ninth abdominal sternite slightly produced and evenly rounded behind, without any ventral appendage.

Female. Hind margin of eighth abdominal sternite very little or not at all produced; genital opening not guarded by valves.

Type. ***Capnella granulata*** sp. nov.

This genus is related to *Takagripopteryx* Okamoto, but differs in venational characters as well as in the structure of the genitalia. Okamoto has erroneously placed *Takagripopteryx* Okamoto in the Family Gripopterigidae.

Capnella granulata sp. nov.

Length to tip of wings, ♂ 3-3.5 mm. Expanse, ♂ 4-5 mm. Length to tip of wings ♀, 6-7 mm. Expanse, ♀ 11-12.5 mm. Length to tip of abdomen, ♂ 5-6 mm.

General color dark brown to blackish. Head a little wider than prothorax; lateral tubercles large, flat, polished; head covered by rather long whitish pile; ocelli small; hind ocelli nearly three times as close to eyes as to each other. Antennae dark brown, with about 30 segments. Prothorax wider than long, rather coarsely punctate; slightly rugose; front angles very broadly rounded, hind angles narrowly rounded; slightly narrowed behind. Legs brown. Wings of male short, not reaching over more than two or three abdominal segments; wings of female as long or little longer than abdomen; wings uniformly subhyaline; veins heavy and dark. Sc reaches to a point about half way between the origin of Rs and the cord; anal field of hind wing nearly as long as the entire wing. Abdomen brown. Cerci brown, composed of 15-17 segments.

Genitalia: *Male.* Eighth abdominal tergite raised into a rearward pointing process which is bifid at the tip so as to form two granulate tubercles; each of these tubercles with a smaller tubercle below; supraanal process modified into a double recurved process, the upper part chitinous, elbowed at the middle, at the tip enlarged and above with a median groove; the lower part of the supraanal process in the form of a hollowed out sheath with a notch on the lateral margin before the tip; subanal lobes terminating in short upcurved spine-like processes; ninth sternite slightly produced into an evenly rounded subgenital plate.

Female. Eighth abdominal sternite not distinctly produced into a subgenital plate.

Holotype, male; *allotype*, female; 14 Mar., 1908, Johnstown, N.Y., Cornell University Collection.

Paratypes: Males and females, 14 Mar., 1908, Johnstown, N.Y.; males and females, Fulton Co., N.Y., C. P. Alexander; one male, 3-1-02, Washington, D.C., H. S. Barber; males and females, 2-12-06, near Embaraas R., Coles Co., Ill.; males and females, Mar. 3, 1903, Plummer's Island, Maryland; males and females, March 25, 1920, Adams Center, N.Y.

Capnella recta sp. nov.

Length to tip of wings, ♂, 3-4 mm.; ♀, 5-6 mm. Expanse, ♂, 4-6 mm.; ♀, 7-8.5 mm.

Length to tip of abdomen, ♂, 4-5 mm.

General color dark brown to blackish. Head dark brown, smooth, wider than prothorax; hind ocelli about twice as close to eyes as to each other.

Prothorax brown, a little wider than long, somewhat widened behind; angles narrowly rounded; surface slightly rugose. Legs brown. Wings of male abbreviated, reaching only about half the length of abdomen in some males, while in others they reach nearly to the tip of abdomen; wings of female reach almost to tip of abdomen; venation very irregular; anal field of hind wings nearly as long as wing. Abdomen brown (last two or three segments blackish in male); cerci composed of about 15 segments.

Genitalia: *Male*. Just before the raised hind margin of eighth abdominal tergite occurs a black, blunt, rounded tubercle, finely granulate above and directed cephalad; supraanal process recurved, short and divided into two parts, the upper flat, heavily chitinized, bluntly round at the tip and above closely beset with short hairs, the lower process in the form of a hollowed out sheath with an enlarged bulbous tip and without notches on the margin; ninth tergite with a depressed membranous area, tenth tergite bifid; ninth sternite slightly produced and evenly rounded; subanal lobes triangular, ending in short, spine-like processes.

Female. Eighth abdominal sternite unmodified.

Holotype, ♂; *allotype*, ♀, March 16, Ithaca, N.Y., Cornell University Collection.

Paratypes. Many specimens, mostly males, from same locality; two males, Interlaken, N.Y., 21 Nov. '12; one male, two females,, Feb. 16, 1907, Dedham, Mass., G. M. Allen.

Capnella incisura sp. nov.

Length to tip of wings, ♂, 3 mm.; ♀, 5-5.5 mm. Expanse, ♂, 4 mm.; ♀, 8-8.5 mm.

Length to tip of abdomen, ♂, 3.5 mm.; ♀, 5 mm.

General color dark brown to blackish. Head wider than prothorax; dark brown; occiput with longitudinal darker lines; hind ocelli at least three times as close to eyes as to each other. Antennae with about 22-25 segments. Prothorax quadrangular, slightly widened behind; angles rounded; surface nearly smooth. Legs brown. Wings of male reaching over one-half to two-thirds of abdomen, of female as long or slightly longer than abdomen; anal field of hind wings nearly as long as rest of wing. Abdomen of female above with a broad median light longitudinal band which extends to the hind margin of the eighth tergite; tergites nine and ten evenly chitinized; male abdomen without a longitudinal stripe; cerci brown, with about 13-15 segments.

Genitalia: *Male*. Hind margin of the eighth abdominal tergite raised into a single rearward pointing blunt tubercle; tergites 9 and 10 with a broad median groove or depression into which the supraanal process fits; supraanal process recurved, divided into two parts, the upper flattened, bluntly pointed, the lower in the form of a hollowed out sheath with a narrow notch on the margin just before the bulbous enlargement; ninth abdominal sternite slightly produced and evenly rounded behind; subanal lobes terminating in short upcurved sharp processes.

Female. Hind margin of eighth abdominal sternite not produced into a subgenital plate; the middle field of the eighth sternite depressed, with two longitudinal outcurved dark lines.

Holotype, male; *allotype*, female, 3-15-07, Ithaca, N.Y., Cornell University Collection.

Paratypes. Many males and females, March 3-30, Ithaca, N.Y.; four males, four females, March 12, Orono, Me.

Capnella vivipara sp. nov.

Length to tip of abdomen, ♂, 4.5-6.5 mm.; ♀, 7-8 mm. Expanse of wings, ♂, wingless; ♀, 5-7 mm.

General color brown. Head brown, slightly wider than prothorax; surface covered with fine pile; occiput somewhat rugulose; hind ocelli at least twice as close to eyes as to each other; antennae brown, darker toward the tip. Prothorax brown, slightly wider than long; somewhat widened posteriorly; angles rounded; surface slightly rugose. Legs brown. Wings absent in the male; very short in the female, not reaching half the length of the abdomen. Abdomen brown, somewhat darker toward the tip; cerci brown, composed of about 15 segments.

Genitalia: *Male.* Eighth abdominal tergite with a black, narrow transverse, raised tubercle before the hind margin; supraanal process recurved, long, divided into two parts: the upper angulate, heavily chitinized and at the tip enlarged; the lower part in the form of a hollowed out sheath, enlarged towards the tip and with a broad notch on the margin before the tip; subanal lobes triangular, upcurved and ending in sharp points; ninth sternite slightly produced and evenly rounded.

Female. Hind margin of eighth abdominal sternite not produced into a subgenital plate.

Holotype, male; *allotype*, female, April 30, Lake Forest, Ill., Cornell University Collection.

Paratypes. Many females and one male, same locality. Many males and several females, March 16, Ithaca, N.Y.; two males, one female 3-7-08, Ithaca, N.Y.; 2 males, 6 females, 7 Apr., Columbia, Mo., C. R. Crosby; 4 males, 8 females, Mar. 21, 1920, Bluff Point, N.Y.; 3 males, 9 Feb. '91, Salineville, Ohio.

This is a viviparous species. A number of the females contain eggs as well as fully formed nymphs which have hatched within the body.

Capnia nana sp. nov.

Length to tip of wings, male, 5.5 mm. Expanse, male, 7 mm.

Length to tip of abdomen, male, 6.5 mm.

General color blackish. Head wider than prothorax, black; ocelli small, the hind ocelli nearly three times as close to eyes as to each other; antennae blackish. Prothorax about as long as wide, blackish; sides nearly straight; angles rounded; surface somewhat rugose, especially toward the center. Legs blackish brown. Wings subhyaline, not reaching to the tip of the abdomen; R in forewing bent upwards at origin of Rs; Rs-M stem of hind wing very short. Abdomen blackish; cerci with more than 10 segments (tips broken off).

Genitalia: *Male.* Eighth abdominal tergite with a small median, raised, chitinized process; ninth and tenth tergites with a median depression; supraanal process recurved, short, reaching part way across segment nine; subanal lobes broadly triangular and ending in short spine-like processes; ninth sternite slightly produced and evenly rounded.

Holotype: male, March, 1923, Terrace, B.C., Mrs. W. W. Hippisley, Cornell University Collection.

Paratype: male, same locality.

Capnia columbiana sp. nov.

Length to tip of wings, male, 7 mm.; female, 10 mm. Expanse, male, 12 mm.; female, 17 mm.

General color blackish brown. Head wider than prothorax, blackish; lateral tubercles large, flat, polished; ocelli small, hind ocelli almost three times as close to eyes as to each other; antennae blackish. Prothorax about as long as wide; sides a little convex; front angles narrowly rounded, hind angles quite sharp; surface very lightly rugose. Legs black. Wings subfumose, the veins heavy; R of forewing sinuate at the origin of Rs; Rs bending down almost at right angle; stem of Rs-M in hind wing short. Abdomen dark brown; cerci blackish, with at least 19 segments.

Genitalia: *Male.* Posterior half of the seventh abdominal tergite raised into a narrow, rounded, hairy, transverse ridge; eighth, ninth and tenth tergites with a shallow median depression; supra-anal process composed of two recurved processes, one above the other, equally long, both heavily chitinized, enlarged toward the tip and at the tip bifid; subanal lobes broadly triangular, upcurved; ninth sternite slightly produced and evenly rounded behind.

Female. Eighth abdominal sternite slightly produced; the hind margin with four triangular, teeth-like processes in some of the females, while in others the margin is nearly straight.

Holotype, male; *allotype*, female; March, 1923, Terrace, B.C., Mrs. W. W. Hippisley, Cornell University Collection.

Paratypes: 6 females, from the same locality.

Capnia excavata sp. nov.

Length to tip of wing, ♂, 6.5 mm. Expanse, ♂, 10.5 mm.

General color blackish brown. Head wider than prothorax, blackish; lateral tubercles large, flat, polished; occiput with longitudinal, polished, interrupted ridges; hind ocelli about three times as close to eyes as to each other; antennae blackish. Prothorax not wider than long; widened behind; angles very broadly rounded; surface moderately rugose, the rugosities blackish. Legs dark brown. Wings lightly fumose; Sc reaches almost to the cord; R of forewing at origin of Rs. Abdomen brown, cerci brown, with almost 20 segments.

Genitalia: *Male.* Hind margin of the eighth abdominal tergite produced upward and backward with a slight notch at the apex, and before the apex a small blunt tubercle; supraanal process recurved, moderately slender at base, but much enlarged before the apex, truncate and ending in slender pointed process; subanal lobes ending in short, upcurved, spine-like processes; ninth sternite slightly produced and evenly rounded behind.

Female unknown.

Holotype: ♂, Jan. 24, 1923, on snow, Feather River Canon near Caribou, Plumas Co., Calif., H. S. Barber. In the National Museum, Washington, D.C.

Paratypes: 8 males from same locality.

Capnia tumida sp. nov.

Length to tip of wings, ♂, 7.5 mm. Expanse, ♂, 12.5 mm.

General color blackish brown. Head a little wider than prothorax; blackish; lateral tubercles large, flat, polished; occiput with a number of longitudinal polished ridges, hind ocelli about twice as close to eyes as to each other; antennae blackish. Prothorax a little wider than long; widened behind; angles broadly rounded; surface moderately rugose, the rugosities blackish. Legs dark brown. Wings lightly fumose; R of forewing bent upwards at origin Rs. Abdomen dark brown; cerci brown, composed of about 19 segments.

Genitalia: *Male*. Seventh abdominal tergite with a raised, black knob which is emarginate behind; ninth and tenth tergites each with a median depression; supraanal process recurved, bifid, much enlarged at the base and tapering to a blunt double point, on the anterior portion of the bulbous enlargement a row of bristles; the enlargement wider than long, flattened above; subanal lobes ending in short, upturned, spine-like processes; ninth sternite slightly produced behind and evenly rounded.

Female unknown.

Holotype: ♂, Dec. 25-26, 1922, Sunnyside Mine near Seneca, Plumas Co., California, H. S. Barber. In the National Museum, Washington, D.C.

Paratypes: 7 ♂ from the same locality. Two of these paratypes are in the National Museum and three are in the Cornell University Collection.

(to be continued.)

EIGHTEENTH ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF AMERICA

The eighteenth meeting of the Entomological Society of America was held in Cincinnati, Ohio, December 27, 28, 29, 1923. It was one of the busiest and best attended meetings ever held by the Society. There were six sessions, three for the presentation of contributions, one for the annual public address, while two sessions were occupied by the business meeting and the Symposium. Attendance at the several sessions ranged from seventy-five to about two hundred. Professor T. D. A. Cockerell, of the University of Colorado, presided throughout the meeting. The subject of the Symposium was "Methods of Protection and Defense Among Insects." Dr. James G. Needham, of Cornell University, delivered the public address under the title, "The Role of Insects in Food Production." He presented a much neglected phase of Entomology.

Sixty-four new members were elected to the Society. The following officers were elected for the year 1924:

PRESIDENT—Chas. W. Johnson, Boston Society of Natural History.

FIRST VICE-PRESIDENT—W. E. Britton, Connecticut Agricultural Experiment Station.

SECOND VICE-PRESIDENT—C.T.Brues, Bussey Institution, Harvard University.

SECRETARY-TREASURER—C. L. Metcalf, University of Illinois.

MANAGING EDITOR OF THE ANNALS—Herbert Osborn, Ohio State University.

EXECUTIVE COMMITTEE—Arthur Gibson, T.D.A. Cockerell, J. H. Emerton, Edith M. Patch, W. D. Funkhouser.

COUNCILLORS TO THE A.A.A.S.—P. P. Calvert, James G. Needham.

NEW MEMBERS OF THE EDITORIAL BOARD—Wm. Schaus, W. E. Britton, E. C. Van Dyke.

NEW MEMBER OF THE THOMAS SAY FOUNDATION—J. Chester Bradley.

—C. L. METCALF, Secretary.